NASA Procedural Requirements

NPR 8715.7
Effective Date: May 30, 2008
Expiration Date: May 30, 2013

COMPLIANCE IS MANDATORY

Expendable Launch Vehicle Payload Safety Program

Responsible Office: Office of Safety and Mission Assurance

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Preface

P.1 Purpose

This NASA Procedural Requirements (NPR) contains NASA's policy, roles and responsibilities, and safety review process requirements for safeguarding people and resources (including flight hardware and facilities) from hazards associated with payloads that will fly on uninhabited Expendable Launch Vehicles (ELVs) (i.e., ELV payloads), including hazards associated with payload to launch vehicle integration, multiple payloads, and payload-related Ground Support Equipment (GSE). This NPR provides for implementation of Safety and Mission Assurance (SMA) Technical Authority (per NPR 7120.5, NASA Space Flight Program and Project Management Requirements) with regard to safety concerns associated with ELV payload projects. This NPR defines the Agency ELV Payload Safety Program.

Note: The primary focus of the Agency ELV Payload Safety Program is on system safety and medical concerns during the prelaunch phase, during launch through payload separation from the launch vehicle, and during any planned recovery. There are many safety and medical disciplines associated with ELV missions, such as on-orbit or in-flight operations, spacecraft/launch vehicle integration, facility safety, institutional safety, range flight safety, nuclear safety, software safety, human factors engineering, occupational health, and environmental health. Each discipline involved in an ELV payload mission performs functions during various project life-cycle phases and may influence or be influenced by one another. Many of these disciplines and their functions, as they apply to the project life cycle, are defined in, and are subject to the requirements of, other NASA directives (see paragraph P.4 of this NPR). The Agency ELV Payload Safety Program remains cognizant of all safety and medical disciplines associated with ELV payload missions and works to assure they are fully integrated.

P.2 Applicability

a. This NPR applies to NASA Headquarters and NASA Centers, including Component Facilities and the Jet Propulsion Laboratory (JPL), and contractors/service providers to the extent specified in their contracts with NASA. Unless otherwise specified, the term "Center" throughout the rest of this document is meant to include NASA Component Facilities and JPL.

b. This NPR applies to uninhabited orbital and uninhabited deep space payloads that fly onboard ELVs (including aircraft assisted ELVs such as Pegasus) and are managed by NASA, whether developed by NASA or any contractor or independent agency in a joint venture with NASA. This NPR does not apply to payloads flown on Space Shuttle or Ares. These NASA launch vehicle programs have vehicle-specific payload safety processes that satisfy the Agency payload safety policy contained in NPR 8715.3, NASA General Safety Program Requirements, and NPR 1800.1, NASA Occupational Health Program Procedures.

c. This NPR contains requirements that apply to each ELV payload and its design, fabrication, testing, vehicle integration, launch processing, launch, and planned recovery; payload-provided upper stages flown on ELVs; interface hardware that is flown as part of a payload; and GSE used to support payload-related operations. This NPR does not address in-flight spacecraft operational safety. The mission success and any scientific objectives of the payload are the responsibility of the

Payload Project Office and are beyond the scope of this document.

d. This NPR applies to ELV payloads developed under a NASA grant or cooperative agreement (to the extent specified in the grant or agreement) to ensure compliance with Federal, State, and local requirements relating to safety as specified in NPR 5800.1, Grant and Cooperative Agreement Handbook (14 CFR 1260.37), and to ensure that the payload project properly implements the safety requirements pertaining to use of NASA facilities and equipment. (See paragraph 1.3.8 of this NPR.)

e. This NPR does not apply to payloads that will fly on suborbital launch vehicles (such as sounding rockets, balloons, or aeronautical vehicles). Suborbital payloads are subject to the policy and requirements of NPR 8715.3 and applicable local processes and requirements. For example: Suborbital launches conducted by Wallops Flight Facility are subject to the Wallops Range Safety Manual (RSM-2002).

f. This NPR does not apply to non-NASA payloads launched from Wallops Flight Facility where NASA is just providing range services, such as for Department of Defense missions or payloads launched under a Federal Aviation Administration commercial launch operator license. Such missions are subject to the local Wallops Range Safety Process and requirements and the regulations and requirements of the other agencies involved.

g. For existing projects, this NPR applies to the project phases (per NPR 7120.5) yet to be completed as of the effective date of this NPR to the extent determined on a case-by-case basis (see paragraph 2.3.1.n of this NPR).

P.3 Authority

a. 42 U.S.C. 2473(c) (1), Section 203(c) (1) of the National Aeronautics and Space Act of 1958, as amended.

b. NPD 8700.1, NASA Policy for Safety and Mission Success.

P.4 Applicable Documents

a. NPR 1800.1, NASA Occupational Health Program Procedures.

b. NPR 2190.1, NASA Export Control Program.

c. NPR 2810.1, Security of Information Technology.

d. NPR 5800.1, Grant and Cooperative Agreement Handbook (14 CFR 1260.37).

e. NPR 7120.5, NASA Space Flight Program and Project Management Requirements.

f. NPR 7123.1, NASA Systems Engineering Processes and Requirements.

g. NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping.

h. NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments.

i. NPR 8715.3, NASA General Safety Program Requirements.

j. Air Force Space Command Manual (AFSPCMAN) 91-710, Range Safety User Requirements

Manual.

k. MIL-STD-882, Department of Defense Standard Practice for System Safety.

l. Range Safety Manual for Goddard Space Flight Center (GSFC)/Wallops Flight Facility (WFF) (RSM-2002).

Note: To address special processes and/or discipline-unique processes, the Office of Safety and Mission Assurance (OSMA) publishes standards that provide specific instructions that are beyond the scope and detail of this document. A listing of applicable Federal requirements, NPRs, and standards can be found in NPR 8715.3.

P.5 Measurement/Verification

Compliance with the requirements contained in this NPR will be verified through processes contained in NPR 8705.6, Safety and Mission Assurance Audits, Reviews, and Assessments.

P.6 Cancellation

a. This NPR cancels NASA-STD-8719.8, Expendable Launch Vehicle Payload Safety Review Process Standard, dated June 1998.

b. This NPR cancels paragraph 3.13.4.5 of NPR 8715.3, NASA General Safety Program Requirements, in its entirety.

/S/
Bryan O'Connor
Chief, Safety and Mission Assurance

Chapter 1. Program Overview

1.1 Introduction

NASA ELV payloads often incorporate hazards which can pose significant risk to life and property. NASA ELV payload missions require the coordination of efforts among a diverse group of participants who have varying responsibilities and authorities. These missions can present unique challenges to the payload safety assurance process, which often involves numerous organizations internal and external to the Agency. The OSMA has established the NASA ELV Payload Safety Program to assist ELV payload projects in achieving safety design objectives and obtaining the necessary safety approvals and to assure that NASA safety policy is satisfied for all ELV payload missions. This chapter contains NASA's ELV Payload Safety Policy and identifies the general roles, responsibilities, and requirements of the NASA ELV Payload Safety Program.

1.2 ELV Payload Safety Policy

Note: NPR 8715.3, NASA General Safety Program Requirements, Chapter 3, contains safety policy applicable to all types of payloads controlled by NASA. The following is consistent with that general Agency policy.

It is NASA policy to safeguard people and resources (including flight hardware and facilities) from hazards associated with ELV payloads and hazards associated with payload to launch vehicle integration, multiple payloads, and payload-related GSE by eliminating the hazards or reducing the risk associated with each hazard to an acceptable level. To accomplish this, it is NASA policy to:

a. Establish and maintain technical and procedural safety requirements applicable to the design, production, prelaunch processing and testing, vehicle integration, launch, and planned recovery of NASA ELV payloads.

b. Coordinate with U.S. or foreign entities that participate in NASA ELV payload projects as needed to identify and ensure compliance with agreed-to safety requirements that apply to each payload.

Note: The requirements of this NPR (including requirements incorporated by reference) apply to all NASA ELV payloads. Most NASA ELV payloads are launched through the NASA Launch Services Program. Special cases may include NASA payload launches on Department of Defense or foreign launch vehicles. The requirements tailoring process defined in this NPR is designed to address typical NASA missions as well as special cases (see paragraph 1.4 of this NPR).

c. Incorporate all applicable safety requirements into the overall requirements for each NASA ELV payload, the contracts for any related procurements, and any related cooperative or grant agreements.

Note: It is the intent of this NPR to ensure adherence to applicable safety requirements that provide an equivalent level of safety for all NASA ELV payloads, other resources, and personnel regardless of where the payload is being processed, including commercial facilities.

d. Maintain an independent payload safety review and approval process designed to ensure that each NASA ELV payload project properly implements all applicable safety requirements and to facilitate safety risk management appropriate to each payload.

1.3 Roles and Responsibilities

1.3.1 The Chief, Safety and Mission Assurance shall:

a. Oversee and provide funding for administration of the NASA ELV Payload Safety Program (Requirement 57547).

b. Approve and promulgate Agency-level ELV payload safety policy and requirements, including the provisions of this NPR and associated implementation documents (Requirement 57548).

c. Designate (or assure the flow-down of) SMA Technical Authority per NPR 7120.5 as applicable to ELV payload missions and the requirements of this NPR (Requirement 57549).

Note: For most NASA ELV payload projects, there is an SMA Technical Authority with overall SMA responsibility for the project who would generally be located within the responsible Center SMA organization. There is also an SMA Technical Authority with responsibility for the launch area processing activities, who is generally the SMA Technical Authority for ELV launches conducted under the NASA Launch Services Program. It is possible for a safety issue to overlap two areas of SMA responsibility. In this case, both SMA Technical Authorities would participate in resolving the issue.

d. Designate, in writing, the NASA ELV Payload Safety Manager (see paragraph 1.3.3 of this NPR) (Requirement 57551).

e. Designate, in writing, the members of the ELV Payload Safety Agency Team (see paragraph 1.3.4 of this NPR) (Requirement 57552).

f. Resolve any conflicts within the ELV payload safety process requiring an Agency-level decision (Requirement 57553).

1.3.2 Each SMA Technical Authority responsible for a payload shall:

a. Approve tailoring of safety requirements per paragraph 1.4 of this NPR (Requirement 57555).

b. Concur on waivers to safety requirements per paragraph 1.5 of this NPR (Requirement 57556).

Note: The Technical Authorities for Engineering and Health and Medical will also be involved in the tailoring and waiver processes as applicable.

1.3.3 The NASA ELV Payload Safety Manager shall:

a. Lead the NASA ELV Payload Safety Program and serve as the Agency focal point for matters involving ELV payload safety (Requirement 57559).

b. Develop and maintain Agency-level ELV payload safety policy and requirements (Requirement 57560).

c. Maintain the safety review and approval process for NASA ELV payloads (Requirement 57561).

Note: The ELV Payload Safety Review and Approval Process is defined in Chapter 2 of this NPR. The NASA ELV Payload Safety Manager's responsibilities specific to the process are provided in paragraph 2.3.6 of this NPR.

d. Provide input and guidance to NASA officials responsible for development of ELV payload-related contracts, grants, and cooperative agreements with entities internal and external to

NASA, including foreign entities (Requirement 57563).

e. Report to the NASA Headquarters OSMA on any ELV payload safety concern requiring an Agency-level decision (Requirement 57564).

f. Participate as an element of the NASA Headquarters Safety and Mission Assurance Audits, Reviews, and Assessments program defined by NPR 8705.6 for the area of ELV payload safety (Requirement 57565).

(1) Participate in appropriate assessments of payload safety processes at NASA Centers, component and range facilities, payload processing facilities (including contractor facilities used to process NASA ELV payloads), and launch sites (Requirement 57566).

(2) Coordinate independent assessments of payload safety processes with the audits, reviews, and assessments performed by the OSMA to ensure an effective and efficient overall safety assessment process (Requirement 57567).

g. Open or further enhance communications regarding NASA ELV payload safety with U.S. and foreign entities and document partnerships, joint activities, and special arrangements through formal agreements (Requirement 57568).

h. Ensure that safety review activities and actions are coordinated with the ELV Payload Safety Agency Team, NASA Centers, ELV payload projects, launch vehicle contractors, and appropriate approving authorities (including the SMA Technical Authority when appropriate) to resolve payload safety concerns in support of overall mission success (Requirement 57569).

i. Establish and maintain an ELV payload safety training program addressing NASA ELV payload safety requirements, safety review and approval process, and related activities (Requirement 57570).

j. Provide a forum for payload safety technical interchange and lessons learned to include educational conferences and workshops for the benefit of the ELV payload community (Requirement 57571).

k. Track and implement lessons learned for continuous improvement of the safety review process and update policy, processes, and requirements as needed (Requirement 57572).

l. Develop and maintain a NASA ELV Payload Safety Program Web site as a tool that may be used by ELV payload projects and other involved organizations to provide access to applicable documents, schedules, notices of special events, and other project and ELV Payload Safety Program information (Requirement 57573).

m. Develop, track, document, and report metrics data on the success of the ELV Payload Safety Program and develop recommendations for continuous improvement and areas of emphasis (Requirement 57574).

n. Ensure appropriate agreements exist with Air Force Range Safety and other external organizations for their participation in ELV Payload Safety Program activities (Requirement 57575).

o. Lead the NASA ELV Payload Safety Agency Team (Agency Team):

(1) Establish and document the activities and processes needed for the Agency Team to satisfy the responsibilities identified in paragraph 1.3.4 of this NPR (Requirement 57577).

(2) Ensure decisions have been coordinated with all Agency Team members (Requirement 57578).

p. For projects existing as of the effective date of this NPR, coordinate with the Payload Project Manager and others as appropriate to determine the applicability of this NPR to the remaining phases

of the project (see paragraph 2.3.1.n. of this NPR) (Requirement 57579).

1.3.4 The ELV Payload Safety Agency Team

The Agency Team is an element of the OSMA and functions to provide Agency-wide perspective and insight on ELV payload safety-related activities in support of the SMA Technical Authority. The Agency Team members shall:

a. Independently assess ELV Payload Projects to assure that the policy and requirements of this NPR (including requirements incorporated by reference) are consistently implemented throughout the Agency (Requirement 57581).

b. Remain cognizant of payload safety concerns and disseminate related information to applicable payload projects (Requirement 57582).

c. Coordinate Agency Team positions regarding any concerns, guidance, or comments applicable to a payload project and provide those positions to the project's Payload Safety Working Group (PSWG) (see paragraph 2.2 of this NPR) as early as possible in the safety review process (Requirement 57583).

d. Provide guidance on ELV payload safety concerns to the Chief, Safety and Mission Assurance and the SMA Technical Authorities, including any issues requiring an Agency-level decision (Requirement 57584).

e. Provide consistent interpretation of safety requirements (including determination of requirements applicability) and provide guidance on the proper implementation of safety requirements (Requirement 57585).

f. Issue interim guidance to the NASA ELV payload community on safety requirements, processes, and specific payload design concerns as needed to assure the policy and requirements of this NPR are satisfied (Requirement 57586).

g. Provide the SMA Technical Authorities with assessments of alternative approaches proposed as part of tailoring and waivers of requirements (see paragraphs 1.4 and 1.5 of this NPR) (Requirement 57587).

h. When making a project-specific decision, coordinate with any other organization that shares safety responsibility for the mission to arrive at a mutually acceptable approach (Requirement 57588).

1.3.5 Each Center Director responsible for a Payload, Payload Processing Facility, or Launch Site (or designee) shall:

a. Establish the Center-level processes and associated requirements needed to ensure that the policy in paragraph 1.2 of this NPR is satisfied for each ELV payload project that uses the Center's resources (Requirement 57590).

b. Support safety assessments of ELV payload activities and respond to all findings and recommendations for which the Center is responsible (Requirement 57591).

c. Ensure that those who have responsibilities defined in this NPR complete the training on the NASA ELV payload safety requirements, safety review and approval process, and related activities (Requirement 57592).

Note: The ELV Payload Safety Manager is responsible for developing an ELV payload Safety training program per paragraph 1.3.3.i of this NPR.

d. Ensure that Center institutional resources (including any GSE and facilities) provided to the payload project to support the processing, testing, vehicle integration, launch, and planned recovery activities of NASA ELV payloads comply with applicable NASA and Center technical and procedural requirements (Requirement 57594).

1.3.6 Each Center Safety and Mission Assurance Director responsible for a Payload, Payload Processing Facility, or Launch Site (or designee) shall:

a. Ensure implementation of this NPR for each ELV payload project that uses the Center's resources (Requirement 57596).

b. Provide each payload project with safety engineering, safety analysis, and other safety expertise needed to ensure the project successfully completes the safety review and approval process defined in Chapter 2 of this NPR (Requirement 57597).

c. Ensure that processes exist and assessments are conducted to ensure compliance with this NPR and the safety of activities within the scope of their authority (Requirement 57598).

1.3.7 NASA Contract, Grant, Cooperative Agreement, or Other Agreement Officers shall ensure that all applicable safety and mission assurance requirements are incorporated into the contracts and agreement(s) governing each payload, including compliance with this NPR, NPR 8715.3, NPR 1800.1, Federal, State, and local requirements, and compliance with and using NPR 5800.1, Grant and Cooperative Agreement Handbook for grants (Requirement 57599).

1.4 Tailoring Process

1.4.1 The overall intent of the ELV payload safety requirements tailoring process is to ensure appropriate oversight of Agency requirements while providing the Centers and project managers with the authority and flexibility needed to accomplish their tasks. For the purposes of the ELV payload safety process, tailoring is defined as the process of assessing the applicability of safety requirements within this NPR and other documents applicable to a payload project and evaluating the project's potential implementation in order to generate a set of specific safety requirements for the project.

1.4.2 The Payload Project Office and the payload project system safety engineer shall work with the PSWG to identify applicable requirements and to tailor a set of mission-specific safety requirements that are compiled into a mission-specific document (see paragraph 2.5.2 of this NPR for the required content of the tailored requirements document) (Requirement 57602).

1.4.3 The PSWG Chairperson (see paragraph 2.3.4 of this NPR) and Agency Team shall coordinate to ensure consistent application of tailoring throughout the Agency (Requirement 57603).

1.4.4 The PSWG Chairperson and the ELV Payload Safety Manager shall coordinate to ensure that authorities involved in the mission or having responsibility for issues addressed by the tailoring, approve (sign) each tailored requirements document or provide equivalent written approval (Requirement 57604).

1.4.5 The signatories of each tailored requirements document shall include, but are not limited to, the Payload Project Manager and responsible NASA Technical Authority(ies) (SMA, Engineering, and Health and Medical, as applicable) (Requirement 57605).

1.4.6 The Payload Project Office shall ensure that the tailored requirements document is completed and approved in accordance with paragraph 2.4 of this NPR (Requirement 57606).

1.4.7 After approval, any further changes to the tailored requirements document must be documented and distributed as a "change page" by the Payload Project Office for coordination and approval/concurrence by the original authorities (Requirement 57607).

1.4.8 If the tailoring of a requirement (i.e., deletion of a requirement, a change to a requirement, or an approach that differs from the stated requirement) results in an increased safety risk, the Payload Project Office shall prepare a waiver request per paragraph 1.5 of this NPR (Requirement 57608).

Note: An approach that differs from the stated requirement may be approved as part of the tailored requirements document provided it does not result in increased safety risk and the document contains sufficient rationale.

1.4.9 In the event that an authority does not concur on a tailored requirements document and the issue cannot be resolved through coordination with the PSWG, the Agency Team, or the SMA Technical Authority(ies), all interested parties shall brief their position to the Chief, Safety and Mission Assurance to identify the best approach to achieve resolution (Requirement 57610).

1.5 Waiver Process

1.5.1 The following implements NPR 8715.3 requirements for processing waivers as they apply to NASA (Agency-level) ELV payload safety requirements. For the purpose of this NPR, a waiver is defined as a written authorization granting relief from an applicable requirement and documenting the acceptance of any associated safety risk.

Note: The waiver terminology and process defined in this NPR are consistent with that of the launch range and payload processing community generally involved in NASA ELV payload missions. This consistency is considered essential to allow clear communication and resolution of waiver issues with the ELV payload community, which includes numerous organizations internal and external to NASA. There may be other Agency policy and terminology related to waivers that are exclusively internal to NASA. The ELV Payload Safety Program remains cognizant of NASA policy related to waivers and works with the payload projects and PSWGs to resolve any implementation concerns. In general, the Tailoring Process, coupled with the Waiver Process (defined by paragraphs 1.4 and 1.5 of this NPR), meet the overall intent of NASA policy to provide for appropriate oversight of Agency safety requirements while allowing the flexibility to accept reasonable risks necessary to accomplish ELV payload missions.

1.5.2 Each Payload Project Manager or designee shall coordinate with their mission PSWG as soon as the project identifies a potential noncompliance with a safety requirement (Requirement 57614).

1.5.3 The Payload Project Manager or designee shall draft the waiver request (Requirement 57615).

Note: The NASA ELV Payload Safety Manager maintains the latest waiver request format and makes it available to all PSWGs.

1.5.4 The Payload Project Manager or designee shall coordinate each waiver request with the PSWG and the Agency Team to:

a. Ensure the waiver request and accompanying data are correct and complete (Requirement 57618).

b. Ensure any risk is properly characterized and that any increase in overall risk is identified (Requirement 57619).

c. Assess any effects the waiver might have on other projects, resources, or requirements (Requirement 57620).

d. Ensure appropriate signatures for approval, concurrence, and risk acceptance per the requirements of NPR 8715.3 (Requirement 57621).

1.5.5 In addition to satisfying the requirements of NPR 8715.3, the signatories of each waiver shall include the Payload Project Manager, responsible NASA Technical Authority(ies) (SMA, Engineering, and Health and Medical as applicable), and other authorities involved in the mission or having responsibility for issues addressed by the waiver (Requirement 57622).

1.5.6 The ELV Payload Safety Manager shall coordinate with the Agency Team and each PSWG Chairperson to ensure a consistent waiver approach for all NASA ELV Payloads (Requirement 57623).

1.5.7 In the event that a required signatory does not concur or approve a waiver and the issue cannot be resolved through coordination with the PSWG, the Agency Team, or the SMA Technical Authority(ies), all interested parties shall brief their position to the Chief, Safety and Mission Assurance to identify the best approach to achieve resolution (Requirement 57624).

Chapter 2. Safety Review and Approval Process

2.1 Introduction

This chapter identifies the roles, responsibilities, and requirements that are specific to the NASA ELV payload safety review and approval process, including the required sequence of activities and associated deliverables. For each NASA ELV payload project, the overall goals of this process are to:

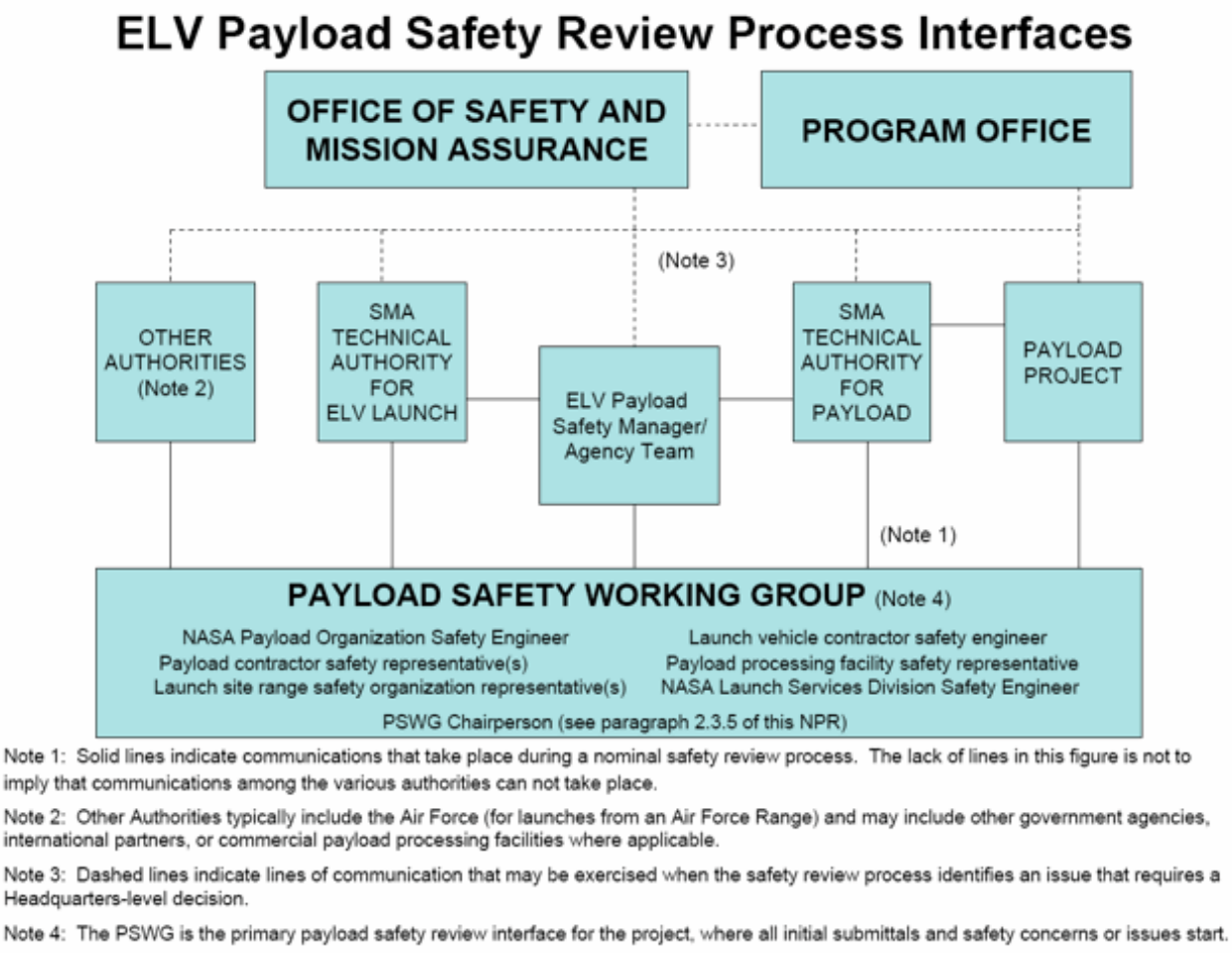
a. Assure the appropriate representation and involvement of all organizations that support the mission.

b. Identify and resolve any safety concerns as early as feasible during the project timeline.

c. Assure that the project obtains the formal approval of all required approving authorities for the mission (internal and external to the Agency).

2.2 Payload Safety Working Group

NASA ELV payload missions involve various combinations of payload organizations, payload contractors, launch vehicles, payload processing sites, and launch sites. To address this situation, a key aspect of the safety review process is the establishment of a unique PSWG for each payload. Each PSWG and its required activities are designed to ensure the appropriate involvement and coordination of all organizations that support the associated mission and share safety responsibility for the mission (internal and external to the Agency). Each PSWG ensures compliance with safety requirements that apply to its payload. Each PSWG provides clear and useful guidance to the Payload Project Office. In addition, each PSWG proactively works with the project to identify potential hazards and safety issues and advises on strategies for early abatement, mitigation, or resolution. Paragraph 2.3.1.i of this NPR identifies the organizations represented in each PSWG.



Note 1: Solid lines indicate communications that take place during a nominal safety review process. The lack of lines in this figure is not to imply that communications among the various authorities can not take place.

Note 2: Other Authorities typically include the Air Force (for launches from an Air Force Range) and may include other government agencies, international partners, or commercial payload processing facilities where applicable.

Note 3: Dashed lines indicate lines of communication that may be exercised when the safety review process identifies an issue that requires a Headquarters-level decision.

Note 4: The PSWG is the primary payload safety review interface for the project, where all initial submittals and safety concerns or issues start.

Figure 2-1, ELV Payload Safety Review Process Interfaces

2.3 Roles and Responsibilities

2.3.1 Each ELV Payload Project Manager (or designee) shall:

a. Ensure that funding and other resources are allocated for payload projects to implement a System Safety Program that complies with this NPR and NPR 8715.3 and properly implements the applicable safety requirements and successfully completes the payload safety review and approval process (Requirement 57633).

b. Ensure that the project technical development, design, test, and review processes incorporate system safety engineering in accordance with NPR 7120.5, NPR 7123.1, NPR 8715.3, and the project's System Safety Plan (see paragraph 2.5.4 of this NPR) (Requirement 57634).

c. Ensure that the design and operations of flight hardware, software, and associated GSE provide for safety through the use of approved design, analysis, and verification techniques (Requirement 57635).

d. Ensure that the payload project's timeline provides for compliance with the established payload safety review and approval process (Requirement 57636).

e. Coordinate with the local SMA organization to assign a Payload Organization Safety Engineer for the project (see paragraph 2.3.2 of this NPR) (Requirement 57637).

f. Ensure the Payload Safety Introduction Briefing (see paragraph 2.4.2.a of this NPR) is coordinated and scheduled early in Phase B as defined in NPR 7120.5 (Requirement 57638).

g. Notify the NASA ELV Payload Safety Manager of the new project and provide contact information for the appointed Payload Organization Safety Engineer (Requirement 57639).

h. Coordinate with the NASA ELV Payload Safety Manager to establish the project's PSWG and ensure that it functions as required by this NPR (Requirement 57640).

i. Coordinate with the NASA ELV Payload Safety Manager to ensure that the PSWG includes the following members, as applicable, to each mission (Requirement 57641):

(1) NASA Payload Organization Safety Engineer

(2) Payload contractor safety representative(s)

(3) Launch site range safety organization representative(s)

(4) Launch vehicle contractor safety engineer

(5) Payload processing facility safety representative

(6) NASA Launch Services Division Safety Engineer

(7) PSWG Chairperson (see paragraph 2.3.4 of this NPR)

Note: Typically, the NASA Launch Services Division Safety Engineer also serves as the PSWG Chairperson. Depending on the mission specifics, there may be advantages to having a PSWG representative from one of the other NASA organizations involved in the mission perform this function. A Co-Chairperson may also be appointed if deemed necessary for any mission.

Composition of the PSWG and member participation may vary based on project activities, technical issues, multi-Center project involvement, or operational requirements.

j. Ensure all project personnel involved in the ELV payload safety review process receive training on the process, understand their associated roles and responsibilities, and have experience commensurate with the complexity of the project (Requirement 57651).

k. Establish and implement any project-level processes and requirements needed to satisfy safety requirements and to ensure that the project fully participates in, and supports, the safety review and approval process activities identified in paragraph 2.4 of this NPR (Requirement 57652).

l. Ensure that all requirements contained in the project's tailored requirements document developed per paragraph 1.4 of this NPR are implemented for its payload and associated GSE or that the project obtains an approved waiver per paragraph 1.5 of this NPR for any requirement not satisfied (Requirement 57653).

m. Ensure spacecraft contractor oversight is defined in the Project Safety and Mission Assurance Plan required by NPR 7120.5 and performed and documented to enable safe integration, testing, and other processing of the payload and prevent the transfer of unanticipated hazards (Requirement 57654).

n. For a project existing as of the effective date of this NPR, coordinate with the PSWG and Agency Team to determine the applicability of this NPR to the remaining phases of the project (Requirement 57655).

Note: The level of implementation of the safety process defined by this NPR for projects in progress will vary with the consideration of the project's success in complying with applicable technical safety requirements, the level of inherent safety risk associated with the project, and the extent of successful completion of project safety milestones. Existing safety-related approvals and decisions will be reassessed as a result of design changes, if new mandatory safety requirements are released, or if a previously unforeseen or newly discovered safety issue is identified.

o. Ensure safety information (including safety review status and any safety concerns associated with each subsystem and integrated system) is presented at appropriate project reviews, including (but not limited to) System Requirement Reviews, Preliminary Design Reviews (PDR), Critical Design Reviews (CDR),

Pre-Environmental Reviews, and Pre-Ship Reviews (Requirement 57657).

Note: The Payload Organization Safety Engineer typically presents the safety information at the various project reviews (see paragraph 2.3.2).

p. Approve all safety review and approval process deliverables per paragraphs 2.4 and 2.5 of this NPR prior to submittal to the PSWG (Requirement 57659).

q. Obtain all safety approvals and ensure safety review activities are completed in accordance with this NPR as needed to accomplish project management requirements per NPR 7120.5 and accomplish mission processing (Requirement 57660).

Note: These activities include completion of:

(1) Safety Review I in time to provide safety status and input to the project's Key Decision Point (KDP) C per paragraph 2.4.2b of this NPR .

(2) Safety Review II in time to provide safety status and input to the project's KDP D per paragraph 2.4.2c of this NPR.

(3) Safety Review III in time to provide safety approval during the project's Pre-ship Review per paragraph 2.4.2.e of this NPR.

r. Ensure that the project fully implements all safety plans and procedures required by this NPR and as approved by the PSWG (Requirement 57665).

s. Ensure that the payload design process incorporates system safety engineering activities integral to identifying hazards, developing solutions to mitigate or eliminate the hazards, verifying the implementation of these solutions, and ensuring compliance with this NPR (Requirement 57666).

t. Ensure that the status of any open items in the Safety Verification Tracking Log, the Safety Action Tracking Log, and any payload safety issues that could impact major project milestones are briefed during safety and project reviews (Requirement 57667).

u. Ensure that the PSWG Chairperson is notified of any mishaps or close calls that take place during launch area payload processing and ground operations (Requirement 57668).

2.3.2 The Payload Organization Safety Engineer for a payload project shall:

a. Perform as the payload organization's primary member of the PSWG (Requirement 57670).

b. Ensure the preparation and submittal of all safety review and approval process deliverables in accordance with schedule timeline requirements specified in paragraph 2.4 of this NPR and following the format and content requirements specified in paragraph 2.5 of this NPR (Requirement 57671).

c. Keep the Payload Project Manager informed of mission safety status (Requirement 57672).

d. Ensure that a Safety Verification Tracking Log is established, maintained, and made available for viewing electronically by the project, PSWG, and Agency Team to track closure of each open hazard control verification identified in the hazard reports (Requirement 57673).

Note: The Safety Verification Tracking Log is a deliverable for Safety Review III per paragraph 2.4.2.e.(2).(ii) of this NPR.

e. Ensure that a Safety Action Tracking Log is established and maintained for the project to track closure of safety actions (Requirement 57675).

Note: The Safety Action Tracking Log is a deliverable for Safety Reviews II and III per paragraphs 2.4.2c.(3)(iii) and 2.4.2.e.(2)(iii) of this NPR.

f. Ensure that technical operating procedures are submitted for review and approval by safety and other

responsible organizations in accordance with the safety requirements of the specific operating location (Requirement 57677).

g. In coordination with the PSWG Chairperson, establish and maintain an integrated schedule of PWSG activities and all relevant project, launch, and other mission milestones, reviews, or meetings that address the topic of payload safety to include place, time, and date for each activity (Requirement 57678).

2.3.3 Each PSWG member shall:

a. Participate in the safety review and approval process (Requirement 57680).

b. Ensure compliance with all safety requirements for their area of responsibility and authority (Requirement 57681).

c. Review and provide comments to the project on all payload safety review deliverables and meeting minutes within 30 days after submittal per paragraph 2.4 of this NPR (Requirement 57682).

d. Assess and concur (or obtain concurrence from their management as needed) on tailoring and any waiver to a safety requirement that is within their scope of responsibility per paragraphs 1.4 and 1.5 of this NPR (Requirement 57683).

e. Coordinate with the PSWG to resolve payload safety concerns and, if needed, with the Agency Team (Requirement 57684).

f. Ensure that payload, facility, and payload/launch vehicle integration issues are disseminated to their organization and to other PSWG members (Requirement 57685).

g. Participate in all PSWG activities associated with their areas of responsibility, including but not limited to meetings, mission safety reviews, design reviews, ground operations reviews, and others activities as required by the PSWG Chairperson (Requirement 57686).

h. Assess and concur on plans and hazard reports for operations in facilities that fall under their safety responsibility as needed to receive and process the payload (Requirement 57687).

2.3.4 The PSWG Chairperson for a payload project shall:

a. Schedule and conduct PSWG meetings (Requirement 57689).

b. Ensure that PSWG activities and decisions include the collective input and participation from all PSWG members (Requirement 57690).

c. Provide official PSWG signature (indicating concurrence from all PSWG members) for all safety review deliverables including hazard reports, Certificate of ELV Payload Safety Compliance (see Appendix C), and any PSWG correspondence (Requirement 57691).

d. Ensure all required safety review deliverables are made available to the PSWG members and others as needed (Requirement 57692).

e. Ensure that the PSWG, the Agency Team, and the Launch Services Program representative are invited to all PSWG activities and have access to all deliverables in accordance with applicable export control requirements (see paragraph 2.6.5 of this NPR) (Requirement 57693).

f. Ensure all comments to safety review submittals are consolidated, coordinated, and furnished to the Payload Organization Safety Engineer no later than 35 days after data submittal (Requirement 57694).

g. Ensure PSWG activities are documented to include notices, scheduling, data receipt and distribution, minutes, data/document review comments, action items, key issues, decisions, and overall project status regarding completion of the safety review and approval process (Requirement 57695).

h. Ensure documentation of actions and major decisions from each PSWG meeting are reviewed for concurrence by attendees at the end of the meeting and draft minutes are available for review following the

meeting (Requirement 57696).

i. Ensure distribution of final minutes within seven business days after each PSWG meeting (Requirement 57697).

j. Ensure availability/distribution/timely notification of the project safety schedule and changes to all parties involved in the safety review and approval process (Requirement 57698).

k. Ensure PSWG participation by appropriate PSWG members, as required, at payload/launch vehicle integration working group meetings (e.g., Ground Operations Working Groups, Mission Integration Working Groups) (Requirement 57699).

l. In coordination with all PSWG members, schedule and conduct PSWG meetings concurrently with major project reviews (e.g., system-level PDR and CDR) and as required to meet the safety milestones in this NPR (Requirement 57700).

Note: Throughout this NPR, "PDR" and "CDR" refer to the project's system-level PDR and CDR.

m. Ensure the Agency Team is informed of any important safety issues to include potential risk issues that may impede the safety review process, waiver issues, and safety requirements interpretation issues (Requirement 57702).

n. Ensure that all mission support and safety-related documents are made available to the PSWG members, Agency Team, the NASA ELV Payload Safety Manager, or other subject matter experts or technical authorities (Requirement 57703).

Note: The preferred approach is to use a secure Web site for this purpose.

o. If the PSWG cannot reach concurrence on an issue, the PSWG Chairperson shall coordinate with the NASA ELV Payload Safety Manager to establish a resolution approach (Requirement 57705).

p. Coordinate with the PSWG and the project to ensure implementation of recommendations, interpretations, and resolutions of any safety concern provided by the Agency Team (Requirement 57706).

Note: The PSWG Chairperson also has responsibilities under the Tailoring Process per paragraphs 1.4.3 and 1.4.4 of this NPR.

2.3.5 The NASA Launch Services Program Manager (or designee), for payloads launched via the Launch Services Program, shall:

a. Provide the funding and other resources needed to ensure that personnel from the launch vehicle contractor (once under contract), Launch Services SMA, and the Range participate in the safety review process beginning no later than the Payload Safety Introduction Briefing (see paragraph 2.4.2 a. of this NPR) and to acquire payload processing facilities (Requirement 57709).

b. Provide the funding and other resources needed to ensure the acquisition and preparation of payload processing facilities for use by the Payload Organization (Requirement 57710).

c. Notify the PSWG of program integration meetings including Ground Operations Working Group, Ground Operations Review, Mission Integration Working Group, and others (Requirement 57711).

d. Ensure that the NASA Launch Services Division Safety Representative is notified of any payload/launch vehicle interface safety concerns (Requirement 57712).

e. Ensure launch services contracts for launch vehicle and commercial payload processing facility contracts contain the provisions needed to satisfy the requirements of this NPR (including requirements incorporated by reference) (Requirement 57713).

2.3.6 The NASA ELV Payload Safety Manager (or designee) shall:

a. Track the status of each payload project as it proceeds through the safety review and approval process and

provide guidance on the associated activities, tools, and deliverables as needed (Requirement 57715).

b. Notify the Payload Project Manager and other authorities:

(1) If a major safety-related risk that may adversely impact the project is identified any time during this safety review process (Requirement 57717).

(2) If the required safety review activities or deliverables of this NPR are not met (or product quality is inadequate for that phase of the project lifecycle) and fail to fulfill the required safety gate products prior to the project's KDPs per NPR 7120.5 and provide guidance on how the project should proceed (Requirement 57718).

c. Sign the Certificate of ELV Payload Safety Compliance upon ensuring that all Agency Team concerns have been addressed (Requirement 57719).

d. Issue a letter forwarding the Certificate of ELV Payload Safety Compliance to the Payload Project Manager and others signifying the successful completion of the ELV Payload Safety Review III and readiness to proceed with shipping and processing (see paragraphs 2.4.2.e and 2.4.3 of this NPR) (Requirement 57720).

Note: The NASA ELV Payload Safety Manager's overall responsibilities for the ELV Payload Safety Program are provided in paragraph 1.3.3 of this NPR.

2.4 Flow of Activities and Deliverables

2.4.1 In accordance with the roles and responsibilities specified in paragraph 2.3 of this NPR, the Payload Project Manager or designee and the PSWG Chairperson are responsible for ensuring that the payload safety review and approval activities take place as required in paragraph 2.4.2 of this NPR. The Payload Organization Safety Engineer ensures the preparation and submittal of the associated deliverables for review. Requirements regarding the contents of the deliverables are specified in paragraph 2.5 of this NPR.

Note: The safety review and approval activities are designed to coincide with and provide safety input to the project management reviews required by NPR 7120.5; e.g., PDR, CDR, and Pre-ship Review. The safety review and approval activities identified below may also provide safety input to other required project, Center, and NASA Headquarters reviews; e.g., Peer Reviews, Launch Readiness Reviews, and Safety and Mission Success Reviews.

2.4.2 The payload project and the PSWG shall ensure that the safety review and approval process incorporates the following sequence of activities and associated deliverables, including compliance with the associated required schedule timing of deliverables (Requirement 57725).

Exception: Process and deliverable dates required by this NPR may be altered through advanced formal agreement between the Payload Project Office and the PSWG provided that safe processing, project schedule, and safety review input to KDPs as defined in NPR 7120.5 are not impacted.

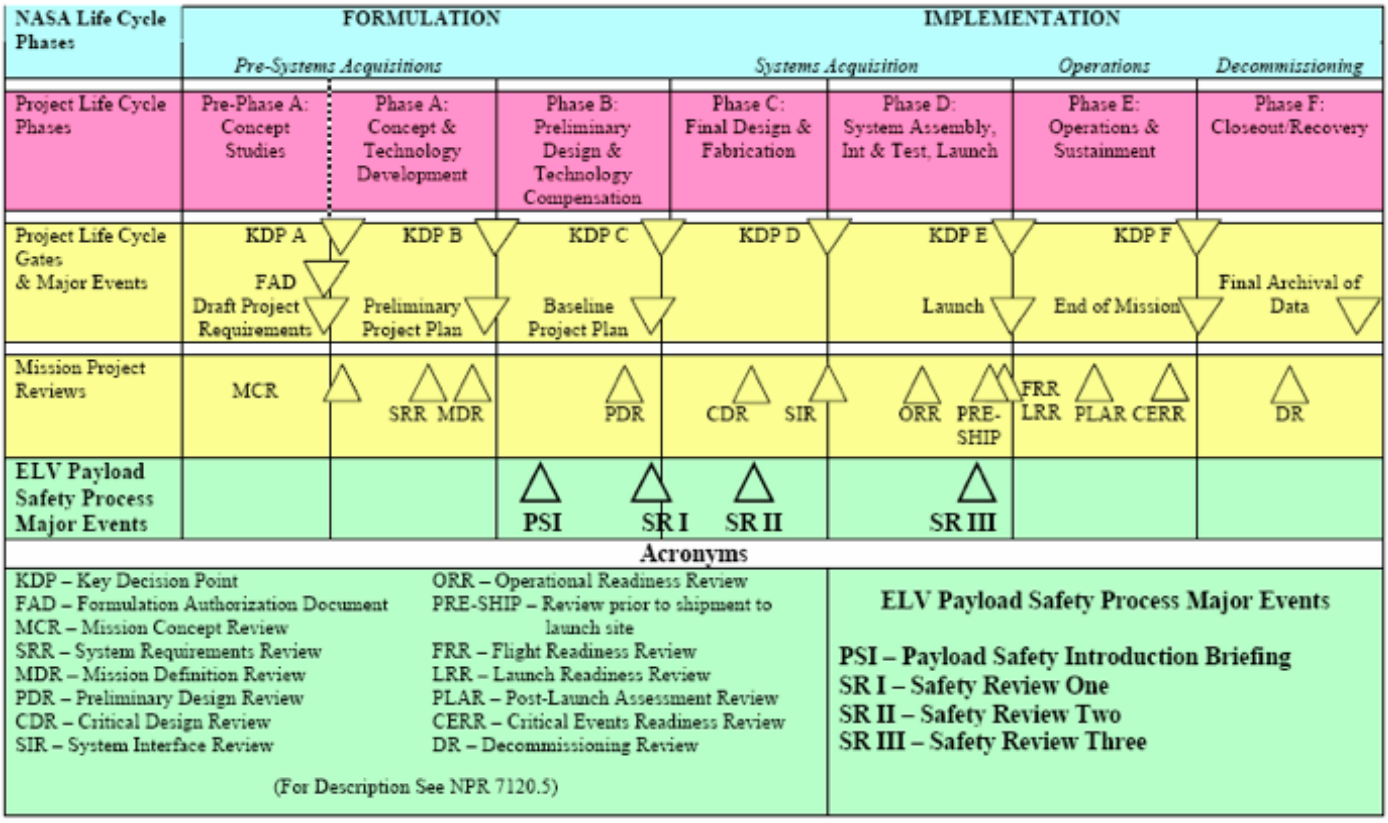


Figure 2-2, Timeline of ELV Payload Safety Program Reviews

Note: The ELV Payload Safety Reviews shown in Figure 2-2 are conducted by a project's PSWG in order to provide necessary safety status and input to the Mission Project Reviews and the project's KDPs.

a. A Payload Safety Introduction Briefing (See definition in Appendix A) shall occur as early as possible but no later than midpoint of the Preliminary Design Phase (Phase B as defined in NPR 7120.5 and depicted in Figure 2-2) (Requirement 57728). This is typically the first meeting of the PSWG. The payload project shall submit:

(1) As a precursor to the tailoring processes, identification of the safety requirement documents that are applicable to the project; applicable previously approved waivers and alternative approaches; and known tailoring issues for presentation and review during the Payload Safety Introduction Briefing (Requirement 57729).

(2) Draft Systems Safety Plan that, as a minimum, provides a conceptual overview of the Systems Safety Program for presentation and review at the Payload Safety Introduction Briefing (Requirement 57730).

(3) Identification of known spacecraft/payload systems and a preliminary assessment of potential hazards documented in a preliminary hazard list for presentation at the Payload Safety Introduction Briefing (Requirement 57731).

(4) A basic Ground Operations Flow Overview providing the location and timeline of major payload activities and tasks for presentation at the Payload Safety Introduction Briefing (Requirement 57732).

Note: This briefing provides a forum for the project to introduce the mission to the PSWG and other authorities and allows for early identification of any safety concerns associated with the payload. The information provided at this briefing should be as complete as the technical maturity of the conceptual design and operations allow.

b. Safety Review I begins with the submittal of data prior to the PDR per paragraph 2.4.2.b.(3) and shall be completed no later than 60 days after the project's PDR or no later than necessary to provide the PSWG's input to the project's KDP C as defined in NPR 7120.5 and depicted in Figure 2-2, whichever date comes

first (Requirement 57734).

(1) Safety Review I shall include a PSWG meeting held in conjunction with the PDR (Requirement 57735).

(2) During Safety Review I, the PSWG shall approve the final System Safety Plan, discuss the resolution of comments to the Safety Data Package (See Appendix A for definition), address requirements issues through the review of the tailored requirements, assess the Preliminary Hazard Analysis and any Hazard Reports, and address any safety issues identified during the PDR (Requirement 57736).

(3) The Payload Project shall submit the following material prior to the PDR meeting:

(i) Final System Safety Plan no later than 30 days prior to the PDR meeting (Requirement 57738).

(ii) Tailored Payload Safety Requirements no later than 30 days prior to the PDR meeting (Requirement 57739).

(iii) Safety Data Package I (as complete as possible) no later than 30 days prior to the PDR Review (Requirement 57740).

(4) The PSWG Chairperson shall provide the Payload Project Manager with the status of Safety Review I including any safety concerns following the PDR meeting (Requirement 57741).

(5) Safety Review I shall culminate with the PSWG Chairperson providing the Payload Project Manager with an assessment of the project's safety efforts and identification of any safety concerns to support the project's KDP C (as defined in NPR 7120.5) (Requirement 57742).

c. Safety Review II begins with the submittal of data prior to the project's CDR per paragraph 2.4.2.c.(3) and shall be completed no later than 60 days after the project's CDR to provide the PSWG's input to the project's KDP D as defined in NPR 7120.5 and depicted in Figure 2-2 (Requirement 57743).

(1) Safety Review II shall include a PSWG meeting held in conjunction with the CDR (Requirement 57744).

(2) During the Safety Review II, the PSWG shall discuss the resolution of comments to the Safety Data Package I, discuss any safety issues identified during the CDR, and review the project for any changes to the design, processing, or interfaces for new or increased hazards or safety issues (Requirement 57745).

(3) The payload project shall submit:

(i) Safety Data Package II no later than 30 days prior to the Safety Review II meeting (Requirement 57747).

(ii) Final Tailored Payload Safety Requirements no later than 30 days prior to the Safety Review II meeting (Requirement 57748).

(iii) The project Safety Action Tracking Log for concurrence to close completed actions and to review open actions and status (Requirement 57749).

(4) Safety Review II shall culminate with the PSWG Chairperson providing the Payload Project Manager with an updated assessment of the project's safety efforts and identification of any safety concerns to support the project's KDP D (as defined in NPR 7120.5) (Requirement 57750).

d. If the payload will undergo processing at a NASA-owned facility or any facility where NASA personnel control the operation or are actively involved in performing work prior to the Safety Review III (see paragraph 2.4.2.e of this NPR), the project shall coordinate to define the applicable requirements and processes for safe payload processing at the host Center that meet the intent of the requirements defined in this NPR (Requirement 57751).

e. Safety Review III begins with the submittal of data per this paragraph 2.4.2.e(2) of this NPR and shall be completed at a PSWG meeting held at least five business days prior to the Launch Services Program's Ground Operations Review which is held before the Payload Project's Pre-ship Review (see Figure 2-2) (Requirement 57752).

Note: Scheduling of the Safety Review III PSWG meeting is done in coordination with the Launch Services Program and the Payload Project. Typically, the Launch Services Program schedules the Ground Operations Review 30 days prior to scheduled hardware arrival at the launch area, and it is held prior to the Payload Project's Pre-ship Review. Completion of Safety Review III allows the PSWG to be prepared to support the Ground Operations Review and present the project's safety status and any issues.

(1) During Safety Review III, the PSWG shall verify that all safety requirements have been satisfied or will be satisfied at the appropriate time or any associated waivers have been approved (Requirement 57754).

(2) The payload project shall submit:

(i) A Safety Data Package III no later than 60 days prior to the Safety Review III, and it shall be finalized satisfying all comments at least 30 days before the intended shipment of hardware to the prelaunch payload processing site (Requirement 57756).

(ii) A Safety Verification Tracking Log identifying the open verifications from the Hazard Reports (Requirement 57757).

(iii) A Safety Action Tracking Log current to the Safety Review III meeting for concurrence to close completed actions and to review open actions and status (Requirement 57758).

(3) The project shall provide a Certificate of ELV Payload Safety Compliance, signed by the Project Manager, with signature blocks for the PSWG Chairperson and the ELV Payload Safety Manager (Requirement 57759).

(4) Safety Review III shall culminate with the PSWG Chairperson and the ELV Payload Safety Manager signing the Certificate of ELV Payload Safety Compliance indicating that the project has safety approval to ship the payload to the launch area (Requirement 57760).

2.4.3 The ELV Payload Safety Manager shall provide the Payload Project Manager with a letter (or equivalent) within 5 days of successful completion of Safety Review III with copies to other officials as appropriate for each mission (Requirement 57761). The letter shall:

a. Indicate that the project has successfully completed the payload safety review process per this NPR (Requirement 57762).

b. Include a copy of the signed Certificate of ELV Payload Safety Compliance including any addendum (Requirement 57763).

c. Identify all conditions or constraints applicable to the safety approvals (Requirement 57764).

2.4.4 After transportation of the payload to the launch area processing facility, the project shall update the Safety Verification Tracking Log at least weekly (more frequently if the open items must be closed to remove operational constraints) and make the current Safety Verification Tracking Log available to all officials involved in the mission (Requirement 57765).

2.5 Content of Deliverables

2.5.1 The Payload Organization Safety Engineer, in coordination with other payload project personnel as needed and the PSWG, shall:

a. Ensure that the content of the safety review process deliverables satisfies the requirements of paragraph 2.5.2 through 2.5.10 of this NPR (Requirement 57768).

b. Ensure that the level of technical detail for each safety review process deliverable is commensurate with the project's life-cycle phase (Requirement 57769).

c. Ensure that changes to deliverables are annotated in such a way that each change is easily located and

verified by the reviewer (Requirement 57770).

2.5.2 Tailored Payload Safety Requirements shall:

a. Document all safety requirements that apply to a payload mission (Requirement 57772).

b. Use Air Force Space Command Manual (AFSPCMAN) 91-710, Range Safety User Requirements Manual as the baseline document for tailoring and include any applicable NASA and local safety requirements that are in addition to those in AFSPCMAN 91-710 (Requirement 57773).

c. In the event of conflicting requirements, incorporate the more stringent (Requirement 57774).

Note: A majority of safety requirements applicable to NASA ELV payloads are currently documented in the Air Force requirements document, AFSPCMAN 91-710. NASA and the USAF(30th and 45th Space Wings) have tentatively agreed to jointly develop requirements for ELV payload safety. NASA and Air Force payload safety requirements will be merged into a mutually agreeable tailoring template, which will serve as the baseline for all ELV payload safety tailoring.

d. Document the applicability of safety requirements to specific situations within a mission (Requirement 57776).

e. Document the interpretation of requirements as needed (Requirement 57777).

f. Address any recommendations, interpretations, or resolutions of safety concerns provided by the Agency Team and each authority involved in the mission (Requirement 57778).

g. Identify any change to a requirement (i.e., any addition or deletion from the source requirement) and include sufficient rationale for the tailored change (Requirement 57779).

h. Identify potential areas of noncompliance with applicable requirements (Requirement 57780).

i. Reference any waivers identified during the tailoring process (see paragraphs 1.4.8 and 1.5 of this NPR) (Requirement 57781).

2.5.3 A Payload Safety Introduction Briefing shall provide the following information to a level of detail consistent with the complexity of the mission, the maturity of the conceptual design, and determination of the launch vehicle and launch site location:

a. Overview of the System Safety Program as defined by the project's System Safety Plan (see paragraph 2.5.4 of this NPR) (Requirement 57783).

b. Identification of organizational roles and responsibilities (Requirement 57784).

c. Identification of applicable safety requirements and compliance documents (Requirement 57785).

d. Description of payload, instruments, and anticipated ground support equipment (Requirement 57786).

e. Description of the flight path in terms of azimuth and trajectory. Identification and description of planned recovery activities and support for sample/payload return if applicable (Requirement 57787).

f. Identification of potential payload/launch vehicle interfaces and mission-unique ground support equipment required for pad operations (Requirement 57788).

g. Identification and a preliminary assessment of potential hazards associated with payload to launch vehicle integration, multiple payloads, and ground systems documented in a preliminary hazard list (Requirement 57789).

h. Overview of Draft Requirements Tailoring, identifying critical assumptions to be made during the tailoring process (Requirement 57790).

i. Identification of any potential noncompliances to NASA, NASA Center, commercial processing facility,

Air Force Range, Federal, State, or local requirements (Requirement 57791).

j. Any potential hazardous failure modes, failure probability, and performance characteristics of the payload during ground operations (Requirement 57792).

k. Identification of planned studies and analyses that support safety requirements, including scheduled completion (Requirement 57793).

l. Description of processing flow and anticipated schedule, integrated with major project milestones (Requirement 57794).

m. Identification of facility requirements, including launch complex, hazardous assembly and checkout areas, and ordnance and propellant storage requirements (Requirement 57795).

n. Identification and discussion of potential contingency operations, for example, depressurization, propellant offload, and accessibility after fairing installation (Requirement 57796).

o. Overview of the Mishap Preparedness and Contingency Plan(s) and their approach for communicating, documenting, and investigating payload prelaunch contingencies including close calls, lessons learned, and mishaps; potential project specific emergency response; and anticipated data impound responsibilities as required by NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping (Requirement 57797).

p. Recommendations for future safety Technical Interchange Meetings, reviews, working groups, subject matter expert support, resolution of unmet requirements, Design Reviews, and other topics as deemed necessary (Requirement 57798).

2.5.4 A System Safety Plan encompassing the payload project's complete system safety program consistent with NPR 8715.3, shall include:

Note: MIL-STD-882, Department of Defense Standard Practice for System Safety also provides guidance for a system safety program.

a. A system safety roles and responsibilities section describing:

(1) Interfaces and lines of communication with associated organizations including decision-making timelines and a description of the methods by which personnel may raise issues of concern to the project manager (Requirement 57802).

(2) Review and approval process (including identification of approving authorities) for commitment of assets to safety efforts (Requirement 57803).

(3) The staffing and responsibilities of key system safety personnel (Requirement 57804).

(4) The tasks and activities required to identify, evaluate, and eliminate or control hazards and to minimize risk (Requirement 57805).

b. System Safety Program Milestones identifying and scheduling safety tasks and activities such as design analyses, tests, and reviews and relating them to major project (mission) milestones (Requirement 57806).

c. System Safety Data identifying deliverable as well as non-deliverable data by title, number, date, and means of delivery or process for accessibility (Requirement 57807).

d. System Safety Interfaces identifying:

(1) The interfaces between system safety and other applicable safety disciplines such as nuclear safety, facility or institutional safety, range safety, explosive and ordnance safety, chemical and biological safety, radiation safety, hazardous materials safety, fire safety, laser safety, software safety, and any others (Requirement 57809).

(2) The interfaces between system safety and design systems engineering (Requirement 57810).

(3) The interfaces between system safety and other support disciplines such as maintainability, quality, reliability, software development, human factors engineering, occupational health, environmental health, and any others (Requirement 57811).

(4) The interface between system safety and all system integration and test disciplines (Requirement 57812).

2.5.5 Preliminary Hazard Assessments and Hazard Reports

a. The payload project shall utilize system safety engineering and analyses to identify potential hazards associated with the payload and to determine how those hazards will be eliminated or controlled (Requirement 57814).

b. The preliminary hazard analyses presented at the time of the Payload Safety Introduction Briefing shall reflect the payload conceptual design, planned interfaces, operations, and identify potential hazards (Requirement 57815).

c. Hazard Reports shall document:

(1) Each hazard, the mechanism(s) for potential occurrence, and resulting outcome (Requirement 57817).

(2) The worst case severity and probability associated with each hazard (Requirement 57818).

(3) The planned mitigations (specific methods for controlling the safety risk associated with each hazard) (Requirement 57819).

(4) How control of the safety risk associated with each hazard will be verified (Requirement 57820).

Note: The status of these verifications is tracked during payload development and processing in a Safety Verification Tracking Log (see paragraph 2.5.9 of this NPR).

(5) The severity and probability associated with each hazard with the mitigations in place (Requirement 57822).

(6) Compliance with the safety requirements applicable to each hazard (Requirement 57823).

2.5.6 Safety Data Package I shall include:

a. Descriptions of hazardous and safety critical flight hardware and software, systems, components, and materials that comprise the payload and ground support equipment and reflect the PDR-level design and operations scenario of the payload (Requirement 57825).

b. A description of the payload and mission (Requirement 57826).

c. Initial descriptions of all payload systems including hazardous and safety critical subsystems, their operation, and interfaces (Requirement 57827).

d. Preliminary hazard reports (as defined in 2.5.5 of this NPR) and summaries of the hazard analyses performed on payload systems (Requirement 57828).

e. Information identifying compliance to the Tailored Payload Safety Requirements (Requirement 57829).

f. For a project utilizing a previously launched payload bus, identification and description of any payload safety-related problems, mishaps, or failures that occurred during fabrication, testing, processing, or integration that could affect the safety of the flight hardware or software, ground support equipment, personnel, or other NASA resources (Requirement 57830).

2.5.7 Safety Data Package II shall include:

a. Updated Safety Data Package I information that reflects the CDR-level design and operations scenario of the payload (Requirement 57832).

b. An updated description of the payload and mission scenario (Requirement 57833).

c. Updated Hazard Reports (as defined in 2.5.5 of this NPR) (Requirement 57834).

d. Detailed narrative descriptions of hazardous and safety critical subsystems, their operation, and updated information identifying methods of compliance to the Tailored Payload Safety Requirements (Requirement 57835).

e. Detailed information of safety features, inhibits, monitoring systems, and their control and status during all processing phases (integration, test, prelaunch, launch, and return (if applicable)) (Requirement 57836).

f. Supporting plans, studies, and reports (provided or referenced), and furnished upon request (Requirement 57837).

g. A description of the ground support equipment, summary of hazardous, non-hazardous, and safety critical operations, a list of hazard reports, and supporting hazard analyses for operations performed in NASA facilities, NASA contracted facilities, and at launch site facilities (i.e., Ground Operations Plan) (Requirement 57838).

h. A cross-reference identifying the disposition of PSWG and Agency Team review comments of Safety Data Package I to indicate where incorporated changes to the Safety Data Package were made (Requirement 57839).

2.5.8 Safety Data Package III shall include:

a. All the Safety Data Package updates and address all comments and incorporate all changes that reflect the as-built configuration and planned processing activities (Requirement 57841).

b. The final as-built description of the payload and mission scenario (Requirement 57842).

c. Final Hazard Reports (as defined in 2.5.5 of this NPR) (Requirement 57843).

d. Updated narrative descriptions of hazardous and safety critical subsystems (Requirement 57844).

e. Updates to supporting plans, studies, and reports; required summaries of test results shall be provided and furnished upon request (Requirement 57845).

f. A record of test failures, anomalies, and mishaps involving qualification hardware, flight hardware, ground support equipment, and software (if used for hazard control), and an assessment of the resolution and safety implications of these events (Requirement 57846).

g. A signed copy of any approved safety waivers (with attachments provided upon request) (Requirement 57847).

h. A cross-reference identifying the disposition of review comments since the last Safety Data Package submittal to indicate where incorporated changes to the Safety Data Package were made (Requirement 57848).

2.5.9 Safety Verification Tracking Log

a. The Safety Verification Tracking Log for a payload project shall document (in a tabular format) the status of the safety verifications identified in the project's Hazard Reports (see paragraph 2.5.5 of this NPR) (Requirement 57850).

b. For each safety verification, the Safety Verification Tracking Log shall list a safety verification tracking number, a brief description of the safety verification, the applicable Hazard Report number(s), the operation(s) constrained by the safety verification, whether independent verification is needed, scheduled and actual completion dates, method of closure, status ("Open" or "Closed"), and any comments (Requirement 57851).

Note: A "Closed" entry in the Safety Verification Tracking Log indicates that mitigations are in place and

that the safety risk associated with the hazard is controlled as specified in the associated Hazard Report. Safety verifications often are best performed at a certain time in the payload processing flow. The Safety Verification Tracking Log is a required submittal by the payload project for Safety Review III (see paragraph 2.4.2e.(2) and is used to ensure the completion of safety verifications even after transportation of the payload to the launch area processing site (see paragraph 2.4.4).

2.5.10 A Safety Action Tracking Log

a. The Safety Action Tracking Log for a payload project shall document (in tabular format) the status of safety-related actions generated from the safety reviews and other safety meetings (Requirement 57854).

b. For each action, the Safety Action Tracking Log shall list an action number, a brief description of the action, the responsible person(s), scheduled and actual completion dates, status ("Open" or "Closed"), and any comments (Requirement 57855).

Note: The Safety Action Tracking Log is a required submittal by the payload project for Safety Review II and Safety Review III (see paragraphs 2.4.2c.(3) and 2.4.2e.(2)) and may also be used by the PSWG Chairperson to record and track actions (see paragraph 2.3.4g).

2.6 Data Submittals

2.6.1 Each payload project shall make data submittals electronically using a NASA secure electronic knowledge management system approved by the PSWG and the ELV Payload Safety Manager (Requirement 57858).

2.6.2 The Payload Project Office shall manage the submission of data to ensure NASA information technology requirements are met; where applicable, ensure access by the PSWG, Agency Team, and others as designated; and that submittals are legible and uploaded in English (Requirement 57859).

2.6.3 All parties shall ensure that NPR 2810.1, Security of Information Technology is followed and that safety data from one project is not shared with unauthorized persons including persons participating on a different project (Requirement 57860).

2.6.4 If a payload project deems it necessary to submit deliverables by an alternative method, the project shall obtain approval from the PSWG and the ELV Payload Safety Manager (Requirement 57861).

Note: A payload project may submit deliverables via electronic mass storage media devices to the PSWG Chairperson who will ensure the deliverables are placed on a secure Web site.

2.6.5 Export Controlled Data

a. The export control data submittal requirements shall apply to U.S. Payload Project Offices only in accordance with NPR 2190.1, NASA Export Control Program (Requirement 57864).

b. Foreign Payload Project Offices are not normally required to provide the U.S. export control classification of their deliverables.

c. In the event that a foreign deliverable requires a U.S. export control classification, NASA export control resources shall be used to classify it (Requirement 57866).

2.6.6 Proprietary Data and Sensitive But Unclassified (SBU)

a. The Payload Project Office and source of data shall determine the necessary requirements for SBU and proprietary data (Requirement 57868).

b. The Payload Project Office shall implement the requirements and provide appropriate instruction (Requirement 57869).

c. The Payload Project Office shall ensure that SBU and proprietary data are distributed only to persons who

have a need to review such data in support of the safety review process (Requirement 57870).

Note: Typically the PSWG, NASA ELV Payload Safety Manager, Agency Team, and all other participating parties, as deemed necessary by the PSWG Chairperson or NASA ELV Payload Safety Manager, will have access to the secure project safety data. It is the responsibility of all parties to follow NASA requirements for controlling the data.

d. If the Payload Project Office discovers that the classification of data has changed, the Payload Project Office shall inform the PSWG and Agency Team in writing (Requirement 57872).

Appendix A. Definitions

A.1 Approving authority(ies). The organization(s) (internal and/or external to NASA) having the responsibility to grant approval/concurrence to perform processing and/or launch activities in their respective facilities, including acceptance of any associated risk.

A.2 Assessment. Review or audit process, using predetermined methods, that evaluates hardware, software, procedures, technical and programmatic documents, and the adequacy of their implementation.

A.3 Audit. A formal review to assess compliance with hardware or software requirements, specifications, baselines, safety standards, procedures, instructions, codes, and contractual and licensing requirements.

A.4 ELV Payload Safety "Agency Team." An agency group appointed by the Chief, Safety and Mission Assurance that performs as an element of the NASA OSMA and provides guidance to the NASA Chief, Safety and Mission Assurance, the NASA ELV Payload Safety Manager, and NASA ELV payload projects. The Agency Team works with the Payload Safety Working Group to resolve any safety concerns associated with a project. The Agency Team also works to ensure that NASA ELV payload safety policy and requirements are adequate and consistently implemented throughout the Agency.

A.5 ELV Payload Safety Manager. A position appointed by the Chief, Safety and Mission Assurance that leads the ELV Payload Safety Program, ensuring Agency policy, requirements, and processes are developed, maintained, and implemented to safeguard people and resources from hazards associated with payload to launch vehicle integration, multiple payloads, and payloads and related GSE. This individual also leads the Agency Team.

A.6 Flight Hardware. Hardware designed and fabricated for ultimate use in a vehicle intended to fly.

A.7 Ground Support Equipment. Ground-based equipment used to store, transport, handle, test, check out, service, and control aircraft, launch vehicles, spacecraft, or payloads.

A.8 Hazard. A state or a set of conditions, internal or external to a system, that has the potential to cause harm.

A.9 Hazard Analysis. Identification and evaluation of existing and potential hazards and the recommended mitigation for the hazard sources found.

A.10 Hazard Control. Means of reducing the risk of exposure to a hazard.

A.11 Hazardous Material. Defined by law as "a substance or materials in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce" (49 U.S.C S 5102, Transportation of Hazardous Materials; Definitions). The Secretary of Transportation has developed a list of materials that are hazardous which may be found in 49 CFR Part 172.101. Typical hazardous materials are those that may be highly reactive, poisonous, explosive, flammable, combustible, corrosive, radioactive, produce contamination or pollution of the environment, or cause adverse health effects or unsafe conditions.

A.12 Hazardous Operation. Any operation involving material or equipment that has a high potential to result in loss of life, serious injury to personnel, or damage to systems, equipment, or facilities.

A.13 Inhibit. Design feature that prevents operation of a function.

A.14 Key Decision Point. (Per NPR 7120.5) An event where the Decision Authority (the Agency's responsible individual who authorizes the transition of a program/project to the next life-cycle phase) determines the readiness of a program/project to progress to the next phase of the life cycle. As such, Key Decision Points serve as gates through which programs and projects must pass.

A.15 Noncompliance. An unsatisfied requirement.

A.16 Operational Safety. That portion of the total NASA safety program dealing with safety of personnel and equipment during launch vehicle ground processing, normal industrial and laboratory operations, use of facilities, special high hazard tests and operations, aviation operations, and use and handling of hazardous materials and chemicals from a safety viewpoint.

A.17 Payload Safety Introduction Briefing. The first meeting of a payload project's PSWG where the Payload Organization briefs the payload to the safety community. This meeting is also referred to as the Concept Briefing with respect to AFSPCMAN 91-710, Range Safety User Requirements.

A.18 Payload Safety Working Group. A working group formed for each NASA ELV payload with a primary purpose to ensure (1) a project's compliance with applicable safety requirements and (2) that the safety risk is identified, understood, and adequately controlled (see paragraph 2.2 of this NPR).

A.19 Programs. For the purposes of this NPR, the term "programs" shall be interpreted to include programs, projects, and acquisitions.

A.20 Projects. For the purposes of this NPR, the term "projects" shall be interpreted to be an ELV payload mission having defined requirements, a life cycle, a beginning, and an end. A project also has a management structure and may interface with other projects, agencies, and international partners. A project yields new or revised products that directly address NASA's strategic needs.

A.21 Range Safety. Application of safety policies, principles, and techniques to ensure the control and containment of flight vehicles to preclude an impact of the vehicle or its pieces outside of predetermined boundaries from an abort which could endanger life or cause property damage. Where the launch range has jurisdiction, prelaunch preparation is included as a safety responsibility. Additionally, the term "Range Safety" is informally used to refer to the organization responsible for implementing/enforcing range safety requirements (e.g., USAF 30th or 45th Space Wings' Safety Offices and the Wallops Flight Facility Safety Office).

A.22 Risk. The combination of (1) the probability (qualitative or quantitative) of experiencing an undesired event, (2) the consequences, impact, or severity that would occur if the undesired event were to occur, and (3) the uncertainties associated with the probability and consequences.

A.23 Risk Management. An organized, systematic decision-making process that efficiently identifies, analyzes, plans, tracks, controls, communicates, and documents risk to increase the likelihood of achieving project goals.

A.24 Risk (Safety) Assessment. Process of qualitative risk categorization or quantitative risk (safety) estimation, followed by the evaluation of risk significance.

A.25 Safety. Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. In a risk-informed context, safety is an overall mission and program condition that provides sufficient assurance that accidents will not result from the mission execution or program implementation, or, if they occur, their consequences will be mitigated. This assurance is established by means of the satisfaction of a combination of deterministic criteria and risk criteria.

A.26 Safety Analysis. Generic term for a family of analyses, which includes but is not limited to,

preliminary hazard analysis, system (subsystem) hazard analysis, operating hazard analysis, software hazard analysis, sneak circuit, and others.

A.27 Safety Critical. Term describing any condition, event, operation, process, equipment, or system that could cause or lead to severe injury, major damage, or mission failure if performed or built improperly, or allowed to remain uncorrected.

A.28 Safety Data Package. A data submittal that provides a detailed description of hazardous and safety critical flight hardware equipment, systems, components and materials that comprise the payload. Includes hazard reports, safety assessments, inhibits, and mitigations. Known as a Missile System Prelaunch Safety Package (MSPSP) with respect to AFSPCMAN 91-710, Range Safety User Requirements.

A.29 Safety Program. The implementation of a formal comprehensive set of safety procedures, tasks, and activities to meet safety requirements, goals, and objectives.

A.30 System Safety. Application of engineering and management principles, criteria, and techniques to optimize safety and reduce risks within the constraints of operational effectiveness, time, and cost throughout all phases of the system life cycle.

A.31 System Safety Plan. A written plan defining the approach to accomplish the project safety activities, including safety management, identification of safety tasks, roles and responsibilities, and the coordination and communication with project/systems engineers and approving authorities. It is also known as the Systems Safety Technical Plan as defined in NPR 8715.3, and the Systems Safety Program Plan defined in Air Force Space Command Manual 91-710, Range Safety User Requirements Manual, Volume III, Chapter 4.

A.32 Tailoring. The process of assessing the applicability of requirements and evaluating the project's potential implementation in order to generate a set of specific requirements for the project.

A.33 Waiver. A written authorization granting relief from an applicable requirement and documenting the acceptance of any associated risk. For NASA ELV payload projects, waivers typically are approved for a single mission and have a specific duration. However, a waiver identified early in the design or specification/requirement review(s) may apply throughout the project or to multiple missions that use a common upper stage and/or a common spacecraft bus.

Appendix B. Acronyms

AFSPCMAN	Air Force Space Command Manual
Agency Team	NASA ELV Payload Safety Agency Team
CDR	Critical Design Review
CFR	Code of Federal Regulations
ELV	Expendable Launch Vehicle
GSE	Ground Servicing/Support Equipment
JPL	Jet Propulsion Laboratory
KDP	Key Decision Point
KHB	Kennedy Handbook
MIL-STD	Military Standard
MSPSP	Missile System Prelaunch Safety Package
NASA	National Aeronautics and Space Administration
NASA-STD	NASA Standard
NODIS	NASA Online Directives Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
OSMA	Office of Safety and Mission Assurance
PDR	Preliminary Design Review
PSWG	Payload Safety Working Group
RSM	Range Safety Manual
SBU	Sensitive but Unclassified
SMA	Safety and Mission Assurance
USAF	United States Air Force

Note: Throughout this NPR, "PDR" and "CDR" refer to the project's system-level PDR and CDR.

Appendix C. Sample Certificate of ELV Payload Safety Compliance

CERTIFICATE OF ELV PAYLOAD SAFETY COMPLIANCE

A. Payload Mission: _____

B. Launch Vehicle: _____

C. The Payload Project Office hereby certifies that the payload complies with all applicable requirements of NPR 8715.XX, Expendable Launch Vehicle Payload Safety Program.

D. Approved Waivers: _____

E. Payload Project Manager Signature for Approval: _____
Date: _____

F. Payload Safety Working Group (PSWG) Concurrence:

The PSWG Members concur that the necessary payload safety requirements of NPR 8715.XX and those safety requirements related to their areas of responsibility and authority are being or are planned to be satisfactorily accomplished. All compliance of safety requirements that are pending successful completion of in-line work required to support and complete this mission must be documented on the Safety Verification Tracking Log and attached.

1) NASA Payload Safety Working Group (PSWG)

Chairperson: _____ Date: _____

USAF Range Safety: _____ Date: _____

Project Safety Engineer: _____ Date: _____

CERTIFICATE OF ELV PAYLOAD SAFETY COMPLIANCE

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G. Pending conditions, actions, or constraints

H. The ELV Payload Safety Manager hereby concurs that the processes and requirements of NPR 8715.XX, Expendable Launch Vehicle Payload Safety Program have been or are planned to be met.

NASA ELV Payload Safety Manager: _____

Date: _____

INSTRUCTIONS FOR COMPLETION OF CERTIFICATE OF ELV PAYLOAD SAFETY COMPLIANCE FORM

Block A: Payload Mission: Insert the name of the payload and/or mission here.

Block B: Launch Vehicle: Identify the launch vehicle that will be carrying the payload.

Block C: Certification Statement.

Block D: List of Approved Safety Waivers/Exceptions: List any approved Safety Waivers/Exceptions for which the ELV Payload Safety Waiver/Exception Form or other safety waiver form has been completed.

Block E: Payload Project Manager Signature and Date.

Block F: PSWG Chairperson Concurrence Signature: The PSWG Chairperson signs and dates concurrence. This concurrence is based on the PSWG's review of safety submittals per NPR 8715.XX, Expendable Launch Vehicle Payload Safety Program and any applicable local safety requirements and represents, to the best of their knowledge, that the safety requirements for their areas of responsibility and authority are or are planned to be met. This concurrence signature represents the PSWG members and may be contingent upon certain conditions, actions, or constraints. These conditions, actions, or constraints shall be listed in Block G. Additionally, all safety-related actions shall be tracked on the mission's Safety Verification Tracking Log and, as necessary, the Safety Action Tracking Log.

Block G: List all conditions, actions, or constraints not annotated on the Safety Verifications Tracking Log (attached) if necessary.

Block H: The NASA ELV Payload Safety Program Manager signature signifies that Payload Project and PSWG have adhered to or are planning to adhere to the processes and requirements of NPR 8715.XX, Expendable Launch Vehicle Payload Safety Program. This signature also represents concurrence from the ELV Payload Safety Agency Team.